

Patent Claims

1. A microscope system comprising a microscope (2) having at least one automatically adjustable subassembly that is provided with at least one adjustable element, comprising a digital camera (25) for acquiring image data of an image of a specimen (40) that is to be analyzed, and comprising a computer system (4) having at least one display (6) and at least one storage unit (9), characterized in that at least the image data of one image is stored in the storage unit (9) and in that data that defines a setting of the microscope (2) that corresponds to the setting of the data belonging to the image data in the storage unit (9) is likewise associated with the image data of the at least one image in the storage unit (9).
2. The microscope system according to claim 1, characterized in that the image data corresponds to the image data of the images acquired by the digital camera (25).
3. The microscope system according to claim 2, characterized in that, in addition to the images acquired by the digital camera (25), image data of at least one reference image is stored in the storage unit (9), and in that data that defines a setting of the microscope (2) corresponding to the setting of the data belonging to the image data in the storage unit (9) is likewise associated with the at least one reference image.
4. The microscope system according to claim 1, characterized in that the at least one automatically adjustable subassembly comprises an objective nosepiece (15), or a microscope stage (18), or a condenser (17), or a magnification changer (19), or at least one filter changer (30), or at least one adjustable diaphragm (31), or at least one brightness controller (32) of a lighting device (33), or the setting of the digital camera (25).
5. The microscope system according to claim 1, characterized in that the at least one automatically adjustable subassembly comprises an objective nosepiece (15) and/or a microscope stage (18) and/or a condenser (17) and/or a magnification changer

(19) and/or at least one filter changer (30) and/or at least one adjustable diaphragm (31) and/or at least one brightness controller (32) of a lighting device (33) and/or the setting of the digital camera (25).

6. The microscope system according to claim 4 or 5, characterized in that the objective nosepiece (15) holds at least one objective (16), in that the objective nosepiece (15) allows several positions, each of which can hold an objective (16), and in that the objective nosepiece (15) is associated with at least one motor (34) that rotates the objective nosepiece (15) between the various positions.
7. The microscope system according to claim 4 or 5, characterized in that the microscope stage (18) is provided with a first, a second and a third motor (21, 22, 23), whereby the first motor (21) moves the microscope stage (18) in the X-direction, the second motor (22) moves the microscope stage (18) in the Y-direction and the third motor (23) moves the microscope stage (18) in the Z-direction.
8. The microscope system according to claim 4 or 5, characterized in that the condenser (17) can be changed over with a motor-driven actuation element (35).
9. The microscope system according to claim 4 or 5, characterized in that the magnification changer can be changed over with a motor-driven actuation element.
10. The microscope system according to claim 4 or 5, characterized in that the filter changer (30) is a filter wheel equipped with a motor (36) that moves the individual filter elements into the optical axis (13).
11. The microscope system according to claim 4 or 5, characterized in that the adjustable diaphragm (31) can be adjusted by means of a motor.

12. The microscope system according to claim 4 or 5, characterized in that the brightness controller (32) for the lighting device (33) comprises an electronic circuit.
13. The microscope system according to claim 4 or 5, characterized in that the setting of the digital camera (25) is specified via a user interface (80) of the digital camera (25) that is depicted on the display (6).
14. The microscope system according to claim 13, characterized in that the user interface (80) of the digital camera (25) is essentially divided into a first area (80<sub>1</sub>), a second area (80<sub>2</sub>) and a third area (80<sub>3</sub>), in that settings for the acquisition of an image can be specified in the first area (80<sub>1</sub>), in that the configuration for the type of digital camera (25) employed can be set in the second area (80<sub>2</sub>), and in that an image acquired by the digital camera (25) is depicted in the third area (80<sub>3</sub>).
15. The microscope system according to claim 1, characterized in that a user interface (50) for handling the image data stored in the storage unit (9) of each image and for handling the settings of the microscope (2) belonging to the image data of each image is depicted on the display (6).
16. The microscope system according to claim 15, characterized in that the user interface (50) for handling the image data stored in the storage unit (9) is divided into several separate windows (50<sub>1</sub>, 50<sub>2</sub>, 50<sub>3</sub>, 50<sub>4</sub>, 50<sub>5</sub>).
17. The microscope system according to claims 15 and 16, characterized in that the user interface (50) for handling the image data stored in the storage unit is divided essentially into a first window (50<sub>1</sub>), a second window (50<sub>2</sub>), a third window (50<sub>3</sub>), a fourth window (50<sub>4</sub>) and a fifth window (50<sub>5</sub>).

18. The microscope system according to claims 16 and 17, characterized in that the microscope type can be entered and displayed in the first window (50<sub>1</sub>) of the user interface (50) for handling the image data stored in the storage unit (9).
19. The microscope system according to claim 16, characterized in that a freely definable description can be entered and displayed in the second window (50<sub>2</sub>) of the user interface (9) for handling the image data stored in the storage unit.
20. The microscope system according to claim 16, characterized in that the setting of the microscope (2) stored in the storage unit (9) for a selected image can be displayed and changed in a third window (50<sub>3</sub>) of the user interface (50) for handling the image data stored in the storage unit (9).
21. The microscope system according to claim 20, characterized in that a name assigned to the stored image data of the image, a file name, the magnification of the objective (16) used to acquire the image, the use of a magnification changer, the size of the diaphragm opening, the brightness, the type of condenser, the illuminated field diaphragm, the filter cube employed, the objective designation, the tube magnification, the X-position of the microscope stage (18), the Y-position of the microscope stage (18), the Z-position of the microscope stage (18), the contrasting method employed, the phototube employed, the article number of the phototube employed as well as the position of the nosepiece (15) are all displayed in the third window (50<sub>3</sub>).
22. The microscope system according to claim 16, characterized in that a list of the names assigned to the individual images made up of the acquired image data is displayed in a fourth window (50<sub>4</sub>).
23. The microscope system according to claim 16, characterized in that the images stored in the storage unit (9) and corresponding to the acquired image data or to the

reference images are displayed in a matrix as thumbnails (73<sub>1</sub>, 73<sub>2</sub>, ..., 73<sub>n-1</sub>, and 73<sub>n</sub>) in a fifth window (50<sub>5</sub>).

24. The microscope system according to claim 23, characterized in that, together with the thumbnails (73<sub>1</sub>, 73<sub>2</sub>, ..., 73<sub>n-1</sub>, and 73<sub>n</sub>), data is likewise depicted that serves for setting the microscope (2) and/or for designating the image data depicted on the thumbnails (73<sub>1</sub>, 73<sub>2</sub>, ..., 73<sub>n-1</sub>, and 73<sub>n</sub>).
25. The microscope system according to one of Claims 1 to 24, characterized in that the computer system (4) is associated with an input unit (38), whereby the input unit (38) is a mouse and/or a trackball and/or a keyboard and/or a touchscreen.
26. The microscope system according to any of claims 1 to 25, characterized in that a user interface (90) can be used to output a message that shows the status of the setting of the microscope (2), that is based on the data that is associated with the image data.
27. The microscope system according to claim 26, characterized in that the subassemblies that go with the type of microscope being used and that are to be adjusted are depicted on the user interface, and in that the subassemblies that are automatically adjusted on the basis of the data associated with the image data are associated with a first message that indicates the change that has been made.
28. The microscope system according to claim 26, characterized in that the subassemblies that go with the type of microscope being used and that are to be adjusted are depicted on the user interface, and in that those subassemblies that cannot be automatically adjusted on the basis of the data associated with the image data are associated with a second message that indicates that the change has not been made for this subassembly.

29. The microscope system according to claim 28, characterized in that the adjustment of the subassembly or subassemblies can be carried out manually by the user.
30. The microscope system according to claim 26, characterized in that the subassemblies that go with the type of microscope being used and that are to be adjusted are depicted on the user interface (100), and in that those subassemblies that are not implemented in the microscope (2) are indicated on the display by a third message.
31. The microscope system according to any of claims 1 to 30, characterized in that a specimen slide (110, 120) is placed onto the microscope stage (18), in that the specimen slide (110, 120) has a marking (115) that can be detected by the microscope system and that constitutes a reference point for the X-value and the Y-value of the microscope stage (18).
32. The microscope system according to claim 31, characterized in that the marking (115) is provided on a non-transparent part of the specimen slide (110).
33. The microscope system according to claim 32, characterized in that the specimen slide (120) has an element that interacts with a counterpart (122) on a slide holder (123).
34. A method for operating a microscope system, comprising a microscope (2) having at least one automatically adjustable subassembly that is provided with at least one adjustable element, comprising a digital camera (25), and comprising a computer system (4) having at least one display (6) and at least one storage unit (9), characterized by the following steps:
  - at least the image data of an image of a specimen (40) that is acquired by the digital camera (25) connected to the microscope (2) is stored in the storage unit (9);

- the image data acquired by the digital camera (25) is stored in the storage unit (9) of the computer system;
- data that defines a setting of the at least one subassembly of the microscope (2) is associated with the image data stored in the storage unit (9);
- an image depicted on a user interface (50) of the display (6) and the appertaining data for the setting of the at least one subassembly of the microscope (2) are selected; and
- the setting of the at least one subassembly is carried out automatically with the at least one adjustable element.

35. The method according to claim 34, characterized in that, in addition to the images acquired by the digital camera (25), image data of at least one reference image is stored in the storage unit (9), and in that data that is used for a setting of the microscope (2) corresponding to the setting of the data belonging to the image data in the storage unit (9) is likewise associated with the at least one reference image.

36. The method according to claim 34, characterized in that the at least one automatically adjustable subassembly comprises an objective nosepiece (15), or a microscope stage (18), or a condenser (17), or a magnification changer (19), or at least one filter changer (30), or at least one adjustable diaphragm (31), or at least one brightness controller (32) of the lighting device (33), or the setting of the digital camera (25).

37. The method according to claim 34, characterized in that the at least one automatically adjustable subassembly comprises an objective nosepiece (15) and/or a microscope stage (18) and/or a condenser (17) and/or a magnification changer (19) and/or at least one filter changer (30) and/or at least one adjustable diaphragm (31) and/or at least one brightness controller (32) of the lighting device and/or the setting of the digital camera (25).

38. The method according to claim 36 or 37, characterized in that the objective nosepiece (15) holds at least one objective (16), in that the objective nosepiece (15) allows several positions, each of which can hold an objective (16), and in that the objective nosepiece (15) is associated with at least one motor (34) that rotates the objective nosepiece (15) between the various positions.
39. The method according to claim 37 or 38, characterized in that the microscope stage (18) is provided with a first, a second and a third motor (21, 22, 23), whereby the first motor (21) moves the microscope stage in the X-direction, the second motor (22) moves the microscope stage in the Y-direction and the third motor (23) moves the microscope stage in the Z-direction.
40. The method according to claim 37 or 38, characterized in that the setting of the digital camera (25) is specified via a display (6), whereby a user interface (80) that is depicted on the display is used to set the digital camera (25).
41. The method according to claim 40, characterized in that the user interface (80) of the digital camera (25) is essentially divided into a first area (80<sub>1</sub>), a second area (80<sub>2</sub>) and a third area (80<sub>3</sub>), in that settings for the acquisition of an image can be specified in the first area (80<sub>1</sub>), in that the configuration for the type of digital camera (25) employed is set in the second area (80<sub>2</sub>), and in that an image acquired by the digital camera (25) is depicted in the third area (80<sub>3</sub>).
42. The method according to claim 34, characterized in that a user interface (50) for handling the image data stored in the storage unit (9) of each image and for handling the settings of the microscope (2) belonging to the image data of each image is depicted on the display (6).
43. The method according to claim 42, characterized in that the user interface (50) for handling the image data stored in the storage unit is divided into several separate windows (50<sub>1</sub>, 50<sub>2</sub>, 50<sub>3</sub>, 50<sub>4</sub>, 50<sub>5</sub>).

44. The method according to claims 42 and 43, characterized in that the user interface for handling the image data stored in the storage unit is divided essentially into a first window (50<sub>1</sub>), a second window (50<sub>2</sub>), a third window (50<sub>3</sub>), a fourth window (50<sub>4</sub>) and a fifth window (50<sub>5</sub>).
45. The method according to claim 43, characterized in that the microscope type is entered and displayed in a first window (50<sub>1</sub>) of the user interface (50) for handling the image data stored in the storage unit.
46. The method according to claim 43, characterized in that a freely definable description is entered and displayed in the second window (50<sub>2</sub>) of the user interface (50) for handling the image data stored in the storage unit.
47. The method according to claim 43, characterized in that the setting of the microscope (2) stored in the storage unit (9) for a selected image is displayed and optionally changed in a third window (50<sub>3</sub>) of the user interface (50) for handling the image data stored in the storage unit (9).
48. The method according to claim 47, characterized in that a name assigned to the stored image data (50) of the image, a file name, the magnification of the objective (16) used to acquire the image, the use of a magnification changer, the size of the diaphragm opening, the brightness, the type of condenser, the illuminated field diaphragm, the filter cube employed, the objective designation, the tube magnification, the X-position of the microscope stage (18), the Y-position of the microscope stage (18), the Z-position of the microscope stage (18), the contrasting method employed, the phototube employed, the article number of the phototube employed as well as the position of the nosepiece are all displayed in the third window (50<sub>3</sub>).

49. The method according to claim 43, characterized in that a list of the names assigned to the individual images made up of the acquired image data is displayed in a fourth window (50<sub>4</sub>).
50. The method according to claim 43, characterized in that the images stored in the storage unit (9) and corresponding to the acquired image data or to the reference images are displayed in a matrix as thumbnails (73<sub>1</sub>, 73<sub>2</sub>, ..., 73<sub>n-1</sub>, and 73<sub>n</sub>) in a fifth window (50<sub>5</sub>).
51. The method according to claim 50, characterized in that, together with the thumbnails (73<sub>1</sub>, 73<sub>2</sub>, ..., 73<sub>n-1</sub>, and 73<sub>n</sub>), data is likewise depicted that serves for setting the microscope (2) and/or for designating the image data depicted on the thumbnails (73<sub>1</sub>, 73<sub>2</sub>, ..., 73<sub>n-1</sub>, and 73<sub>n</sub>).
52. The method according to any of claims 34 to 51, characterized in that the computer system (4) is associated with an input unit (38), whereby the input unit is a mouse and/or a trackball and/or a keyboard and/or a touchscreen.
53. The method according to any of claims 34 to 51, characterized in that a user interface (90, 100) is used to output a message that shows the status of the setting of the microscope (2), that is based on the data that has been associated with the image data.
54. The method according to claim 53, characterized in that the subassemblies that go with the type of microscope being used and that are to be adjusted are depicted on the user interface (90, 100), and in that the subassemblies that are automatically adjusted on the basis of the data associated with the image data are associated with a first message that indicates the change that has been made.
55. The method according to claim 53, characterized in that the subassemblies that go with the type of microscope being used and that are to be adjusted are depicted on

the user interface (90, 100), and in that those subassemblies that are not automatically adjusted on the basis of the data associated with the image data are associated with a second message that indicates that the change has not been made for this subassembly.

56. The method according to claim 55, characterized in that the adjustment of the subassembly or subassemblies is carried out manually by the user.
57. The method according to claim 53, characterized in that the subassemblies that go with the type of microscope being used and that are to be adjusted are depicted on the user interface, and in that those subassemblies that are not implemented in the microscope are indicated on the display by a third message.
58. The method according to any of claims 34 to 57, characterized in that a specimen slide (110, 120) is provided with a marking, whereby the marking is detected by the microscope system and it constitutes a reference point for the X-value and the Y-value of the microscope stage.